

## Structural Composites with Intrinsic Multifunctionality, Phase II

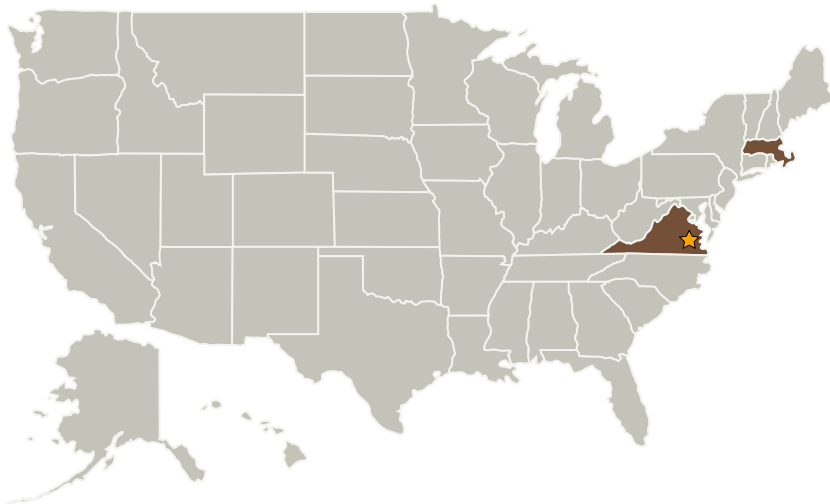
Completed Technology Project (2004 - 2006)



## Project Introduction

Development of multifunctional, structural materials for applications in terrestrial and space-based platforms is proposed. The principle innovation is the development of an epoxy-based thermoset that undergoes a phase separation reaction during cure to form interpenetrating networks (IPN) of a structural thermoset (epoxy) phase and a second phase that is tailored to provide ancillary function. Both phases are co-continuous and nano-structured, having typical dimensions of 40-200nm. The second phase has controllable viscoelastic properties to provide mechanical damping and other strain-rate dependent behavior. Additional functionality is obtained by sequestering appropriate materials into the second phase. Examples include ionizable salts to provide ionic conductivity, reducible and oxidizable materials for power source applications and reactive species for composite self-repair. In the phase I, the IPN epoxy was used as a matrix for graphite fiber reinforced composites. Within this matrix material, a novel mechanism for vibration damping was revealed and reactive oligomers for self-repair were successfully incorporated without loss of reactivity. Internal electrochemical reactions, which can be used for electrical power generation and myriad other applications, were demonstrated. In the phase II, high performance IPN epoxies, capable of extended service at 150°C and above will be developed and optimized for vibration damping and self-repair functionality.

## Primary U.S. Work Locations and Key Partners



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## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Center / Facility:**

Langley Research Center (LaRC)

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia
EIC Laboratories, Inc.	Supporting Organization	Industry	Norwood, Massachusetts

## Primary U.S. Work Locations

Massachusetts	Virginia
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## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

## Technology Areas

**Primary:**

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - └ TX12.1 Materials
    - └ TX12.1.1 Lightweight Structural Materials